

# **International Graduate Program for Bioscience and Biotechnology**

## **1. IGP (A) Outline**

### **“Objectives”**

The School of Life Science and Technology nurtures students who will be able to contribute to the creation of universal intellectual basis and give it back to the society with an ethical worldview through elucidation of biological mechanisms and through pioneering new engineering applications based on the biological knowledge.

Since 2007, the School of Life Science and Technology (the former Graduate School of Bioscience and Biotechnology) has established an international graduate course for foreign students, especially excellent students from East Asian countries. In 2013, as making advances in this graduate course, we have launched a new international education program including master, doctoral and integrated master's and doctoral curricula designed to help students cultivate their creativity, learn practical working skills, and improve their English and Japanese capabilities. IGP (A) is one of this international program and, in this IGP (A), we foster international leaders able to develop leading-edge R&D in innovation of science and technology and construct a bridge between Japan and other nations in the future.

IGP (A) is a combined master's and doctoral education and considered to be one continuous course of study, which cannot be divided into two separate curricula. A student is required to enroll in the Tokyo Tech Master's course firstly, regardless of whether or not they have already earned a Master's degree. A maximum of 10 credits from a graduate school in which students have studied may be transferred to Tokyo Tech upon approval.

### **1-1. Graduate Major(s) available to IGP (A) Students**

Graduate Major in Life Science and Technology

(Graduate Major in Human Centered Science and Biomedical Engineering)

## **2. Competencies Developed**

### **[Integrated Master's and Doctoral Degree]**

IGP (A) students aim to acquire the following skills at a high level in order to achieve the above objectives.

- Broad, exceptional expertise centered on the “Life Science and Technology” field
- Exceptional problem-setting and problem-solving skills underpinned by expertise and high ethical standard, as well as the innovative creativity to pioneer new technologies and new theoretical paradigms
- Exceptional sophistication and communication skills for exhibiting leadership on the global stage

## **3. Learning Goals**

### **[For Master's Degree]**

To acquire the skills listed in “Competencies Developed”, students in this IGP (A) will study the following.

#### **A) Acquiring advanced expertise in the field of “Life Science and Technology”**

Acquiring advanced expertise in the research field of “Life Science and Technology” through Research Seminars, Research-Related Courses, and Major Courses

#### **B) Acquiring the knowledge of a broad range of science and technology fields**

Learning broad knowledge conducive to the development of science and technology through abundant Major Courses

#### **C) Acquiring research-executing skills, problem-setting skills, problem-solving skills, and innovative creativity**

Acquiring research-executing, problem-setting, problem-solving, and academic writing skills as well as innovative creativity through Research Seminars, Research-Related Courses, and exercises and experiments in Major Courses

D) Acquiring international communication skills

Learning advanced communication skills required as international professionals through Humanities and Social Science Courses, Career Development Courses, and Major Courses

E) Cultivating sophistication in relation to bioethics and society

Learning ethical and social values relevant to life and research in “Life Science and Technology” through Humanities and Social Science Courses, Career Development Courses, and exercises and experiments in Major Courses

**[For Doctoral Degree]**

In order to acquire the skills listed in “Competencies Developed”, students in this IGP (A) will study the following.

A) Acquiring exceptional expertise centered on the “Life Science and Technology” field

Advancing expertise in the research field of “Life Science and Technology” and skills to evaluate research in that field through Research Seminars, Research-Related Courses, and exercises and experiments in Major Courses

B) Acquiring research-executing skills, problem-setting skills, problem-solving skills, and innovative creativity

Acquiring exceptional research-executing skills, problem-setting skills, problem-solving skills, and academic writing skills, as well as the innovative creativity to pioneer new technology and theoretical paradigms through Research Seminars, Research-Related Courses, and exercises and experiments in Major Courses

C) Acquiring international communication skills

Learning exceptional communication skills for exhibiting leadership on the global stage through Humanities and Social Science Courses, Career Development Courses, and exercises and experiments in Major Courses.

D) Acquiring leadership and research-planning and -organizing skills

Learning skills to plan and lead advanced research as a next-generation leader through Career Development Courses, Research Seminars, and exercises and experiments in Major Courses

E) Nurturing sophistication in relation to bioethics and society

Developing strong ethical and social views towards life and research in “Life Science and Technology” through Humanities and Social Science Courses, Career Development Courses, and exercises and experiments in Major Courses

#### **4. IGP (A) Completion Requirements and Courses**

##### **[For Master's Degree]**

##### **[1.] IGP (A) Completion Requirements**

- IGP (A) students are required to acquire Directed Collaboration Works (2 credits).

Under this program, in addition to the above-mentioned requirements, students must also fulfill the Graduate Major completion requirements of their departments (degree completion requirements). For completion requirements of your Graduate Major, please refer to the relevant Graduate Major pages in “Guide to Graduate Majors (for IGP)”.

##### **[2.] IGP (A) Courses**

**Table M1. Courses of IGP (A)**

Course category		Course number	Course title			Credits	Competencies	Learning goals	Comments
Major courses	400 level	LST.A418	◎	★	Directed Collaboration Works	2-0-0	1,2,3,4,5	B,C,D	
Note : <ul style="list-style-type: none"><li>• ◎ : Required course</li><li>• Competencies: 1 = Intercultural skills; 2 = Communication skills; 3 = Specialist skills; 4 = Critical thinking skills; 5 = Practical and/or problem-solving skills</li></ul>									

Under this program, in addition to the above-mentioned requirements, students must also fulfill the Graduate Major completion requirements of their departments (degree completion requirements). For core courses of your Graduate Major, please refer to the relevant Graduate Major pages in “Guide to Graduate Majors (for IGP)”.

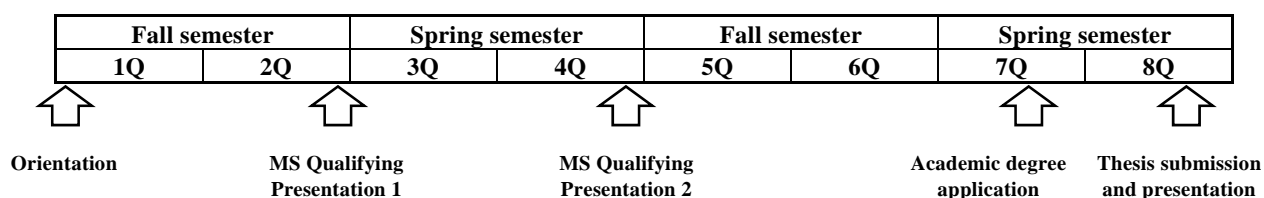
## **Example of a Standard Curriculum**

In the Graduate Major in Life Science and Technology (Master's Degree curriculum), courses are arranged best to train internationally successful science and engineering professionals with high ethical standard as well as skills conducive to further developing research and development related to "Life and Science Technology".

The Master's Degree curriculum requires students to take LST Seminars, MS Qualifying Presentation 1 and 2, LST Directed Laboratory Work and Directed Collaboration Works, with the goal of helping students acquire research-executing skills, problem-setting skills, problem-solving skills, and innovative creativity. In addition, LST Academic Writing 1 and 2, Career Development Seminars, and LST Frontier Seminar 1,2,3,4 will be offered to students to learn communication and leadership skills, thereby nurturing promising scientists and engineers. Furthermore, to acquire broad, deep, and advanced expertise in the field of "Life Science and Technology", students are expected to choose well-balanced courses from 400- and 500-level Major Courses depending on their own research field. Therefore, specific curriculum examples by field are not given.

## **Research Related to the Completion of Master Theses**

In master's thesis research, students improve their problem-setting, problem-solving, and communication skills through a series of research activities. A relevant research line is shown in the following diagram.



- Research concept presentation, interim research presentation  
In order to be conscious of the background and goals of their own research, students make a "research concept presentation" (MS Qualifying Presentation 1), where they submit a program for their entire research in 2Q. In 4Q, they make the "interim research presentation" (MS Qualifying Presentation 2). After the research concept presentation, if the major approves it, students may take 600-level Major Courses (with the exception of Humanities and Social Science Courses and Career Development Courses). However, keep in mind that these may not be counted as a requirement for master's program completion.
- Thesis examination criteria
  - 1) The self-written paper in the field of "Life Science and Technology" must include novel and original observations and insights, and describe own discussions.
  - 2) Existing research related to the paper's topic must be appropriately and systematically reviewed.
  - 3) The degree-seeking student must understand the results and significance of the research sufficiently.
  - 4) The main part must have been presented at an academic conference related to "Life Science and Technology", or the content must be at an equivalent level.
- Procedure for thesis examination  
The examination committee is comprised of 5 or more referees (3 or more teaching staff in charge of the Life Science and Technology major). After the peer review by referees done in advance, an oral presentation is made and a final examination and evaluation are performed.

**[For Doctoral Degree]**

**[1.] IGP (A) Completion Requirements (Recommended)**

- IGP (A) students are recommended to acquire IGP Off-Campus Training I or II (1 credit each).

Under this program, in addition to the above-mentioned requirements, students must also fulfill the Graduate Major completion requirements of their departments (degree completion requirements). For completion requirements of your Graduate Major, please refer to the Graduate Major pages in “Guide to Graduate Majors (for IGP)”.

**[2.] IGP (A) Courses (Recommended)**

**Table D1. Courses of IGP (A) (Recommended)**

Table D1. Courses of IGP (A) (Recommended)									
Course category		Course number	Course title			Credits	Competencies	Learning goals	Comments
Major courses	600 level	LST.C607		★	IGP Off-Campus Training I	0-1-0	1,2,4,5	A,C,E	
		LST.C608		★	IGP Off-Campus Training II	0-1-0	1,2,4,5	A,C,E	
Note : • ☉ : Required course • Competencies: 1 = Intercultural skills; 2 = Communication skills; 3 = Specialist skills; 4 = Critical thinking skills; 5 = Practical and/or problem-solving skills									

Under this program, in addition to the above-mentioned requirements, students must also fulfill the Graduate Major completion requirements of their departments (degree completion requirements). For core courses of your Graduate Major, please refer to the relevant Graduate Major pages in “Guide to Graduate Majors (for IGP)”.

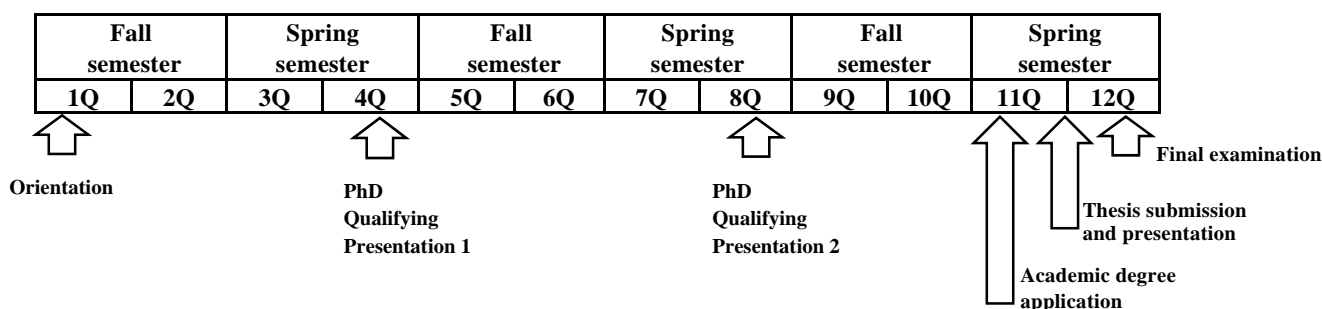
### Example of a Standard Curriculum

In the Graduate Major in Life Science and Technology (Doctoral Degree curriculum), courses are arranged best to train internationally successful science and engineering talents with broad and exceptional expertise centered on the “Life Science and Technology” field, skills to advance top level research and create new technologies, as well as high ethical standard.

The doctoral curriculum requires students to take the PhD Qualifying Presentation 1 and 2, and LST Seminar S3 to F5, with the goal of helping students acquire research-executing skills, problem-setting skills, problem-solving skills, and innovative creativity. In addition, LST Bioleader Training 1 and 2, PhD Internship 1 to 4, and Career Development in Industry will be offered for students to learn communication and leadership skills. In total, this education system will nurture students as exceptional scientists and engineers, and therefore, specific curriculum examples by field are not given.

### Research Related to the Completion of Doctoral Theses

In doctoral dissertation research, students cultivate their problem-setting and problem-solving skills, and improve their English communication skills through a series of research processes. A relevant dissertation research time line is shown in the following diagram. In 4Q and 8Q, students make the interim presentation (PhD Qualifying Presentation 1 and 2). Continuing on, they submit and present their thesis in 12Q.



- Doctoral dissertation examination criteria
  - 1) The self-written paper in the field of “Life Science and Technology” must be novel and original, with sufficient academic significance.
  - 2) The main part must have been published or be accepted for publication in an international, peer-reviewed academic journal, with the degree-seeking student as a mainly-contributing author.
  - 3) The degree-seeking student must have sufficient linguistic skills to carry out research internationally.
- Procedure for doctoral thesis examination
 

The examination committee is comprised of 5 or more referees (3 or more teaching staff in charge of the Graduate Major of Life Science and Technology). After an oral presentation and peer review by the referees, a final examination and evaluation, including those of linguistic skills, are performed.